Assessing Climate Change Effects on Natural and Cultural Resources of Significance to Northwest Tribes

1. ADMINISTRATIVE

Project title: Assessing Climate Change Effects on Natural and Cultural Resources of Significance to Northwest Tribes

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2. PUBLIC SUMMARY.

This research project sought to understand ways in which some aspects of Native American culture has been affected by climate change in the Northwest United States. There are aspects of tribal culture, such as songs, stories, prayers, and dances that include fish, wildlife, or plants as central images or main symbolic figures, and therefore may be affected by environmentally driven changes. The intimate connections that tribes have maintained with the natural environment are more spiritually rich and complex than non-Native consumptive views of natural resources. Our study involved three Northwest tribes (Confederated Tribes of Salish and Kootenai, Quinault Indian Nation, and the Confederated Tribes of Siletz Indians), after careful consideration of tribes' size, level of cultural activity, strength of ties to the environment, and connection to culturally significant and aboriginal geographic regions. The information was collected through interviews with tribal elders and individuals with substantial cultural expertise. We found, in addition to changes in specific cultural practices, a profound disruption to identity connected with (a) changes in seasonality, disturbing the sense of natural time; and (b) a sense that wisdom passed down through generations is no longer a sound basis for which decisions are made. These observations contribute an understanding of Northwest tribal culture and its vulnerability and adaptive capacity to a changing climate. This research documented traditional cultural commonalities among the tribes involved with this project and illustrated inter-tribal cultural adaptations to their prevailing environmental conditions. The results of this study will also provide tribes a resource to assess climate change impacts on their cultural practices and identity.

3. TECHNICAL SUMMARY.

The original goals of this research were to interview tribal elders from four carefully chosen tribes and classify their responses about cultural impacts into four categories: cultural activities that, in response to climate change, 1) continued unchanged, 2) were performed only intermittently, 3) were adapted, or 4) had been discontinued. We found instead, as described below, that the actual cultural responses were much richer and more nuanced than this initial classification scheme.

The data from this research was compiled through interviews conducted in person and audio recorded into a digital recording device. These audio files were then transferred to the computer, and transcribed fully into word documents that could be read as documents. Each document included a direct translation of interviewees' inflection, intonation, pausing, and stressors of the interview they provided. This included any lengthy pauses which were culturally appropriate, or silences which indicated any information.

The compiled information was then categorized into the most commonly mentioned subjects, and then ranked into topics which interviewees spoke about with more fervency, repetition, or conviction. Whether they corresponded to the questions outlined, or were offered by the subject. Most of the subjects discussed events and conditions in terms of TEK, but acknowledged the western scientific information they have heard or seen as well.

The objectives and work incorporated both Traditional Ecological Knowledge (TEK) and, to a limited extent, western science to guide and complete the research project. TEK is based on observation of environmental surroundings over long periods of time and is an integral aspect of Indigenous cultural knowledge. The Northwest Climate Science Center Tribal Engagement Strategy recognizes that native culture is holistic in nature and, therefore, it is important to pair TEK and western science techniques in order to assist with a fuller understanding of the culture and the research. In this project, the approach intended to capture the behaviors and patterns of Native American traditional culture in the Pacific Northwest that have been shifting in response to abundance or availability of natural resources. This project relies on social science methods which are typically more efficient tools for collection and analysis of research of human subjects in Native American populations.

This research, in particular the key results explained below, contributes to the national understanding of the cultural dimensions of climate change. These dimensions reach well beyond visible, regular cultural expressions like ceremonies, into the very perception of time, space, and reality. Few other research projects have delved deeply enough into Native thinking around climate change to identify and articulate such results.

4. PURPOSE AND OBJECTIVES.

This project carries out research pertaining to the effects of climate on aspects of the environment and resources relevant to NW tribes. This research will provide insights regarding possible responses of tribal culture to focal animals and plants that, in turn, are exposed and responding to changes in climate. The results are vital to both understanding northwest tribal cultural identities, and to tribes' understanding of how climate changes have already impacted traditional cultural resources and practices or how they may do so in the future. Tribes are disproportionately affected by climate change because their economies and traditions are heavily reliant on place-based natural resources. Because natural resources are integral to Native populations' identity and central to many cultural practices, changes in these resources may result in associated shifts and adaptations in tribal cultural traditions.

The study provides a uniquely novel perspective that examines tribal cultural traditions where the traditional behaviors and patterns are possibly being impacted by climate change. The natural resources for tribal communities are being exposed to shifts in climate. Tribes will be able to anticipate climate changes that have the potential for significantly altering cultural behaviors and traditions, because of the issues identified within this study. Tribes will also be able to view neighboring tribes' techniques for adapting to changes that may have occurred or are occurring. This provides an opportunity for enhanced communication among tribes and possible coordination of inter-tribal efforts to safeguard valuable cultural practices.

The project was originally conceived as a two-year project involving four tribes within the northwest region, offering a broadly representative and cohesive sample of tribes and individuals which would represent two coastal tribes and two inland tribes. The decision was made by the funding agency to change the project to 11 months and to exclude the fourth tribe, preventing cross-comparisons envisioned in the original project design, so analysis was completed taking into account similar cultural factors across the available interviewees.

5. ORGANIZATION AND APPROACH.

This project engaged cultural resource managers from the three tribes (Confederated Tribes of Salish and Kootenai, Quinault Indian Nation, and the Confederated Tribes of Siletz Indians) to identify Elders and/or individuals who have cultural expertise of their respective tribe. A minimum of four tribal participants from each tribe were selected to participate in an informal, semi-structured interview. A list of questions were used as prompts to guide and elicit responses from each participant. Upon participant approval, the interviews were audio recorded and scheduled to take advantage of when it is considered culturally appropriate to discuss specific cultural topics through oral discourse, often termed “talking story” by Native cultures in the Northwest. This time period usually occurs in the fall and winter seasons.

Budget limitations allowed for sixteen (16) participants to be paid for the study. The maximum enrollment for the project was twenty (20) participants. Because of project alterations and removal of the fourth tribe, there were eleven (11) total participants.

Recruitment - Tribal Cultural Resource Departments were contacted via phone calls and/or emails to initially identify interest in the project and to provide guidance on key tribal individuals as possible participants. Purposeful sampling then commenced by identifying key respondents who held critical information. Individuals identified as having information critical to this research study were then contacted through the respective tribal cultural resources department, or through phone calls. Interviews were arranged through the respective tribes’ cultural resources department when possible. The researcher directly contacted individuals not arranged through tribal department representatives to schedule interviews when it was appropriate. Upon agreement of the individuals, a meeting date and time was established for the interview.

Oral Consent Process- The oral consent process occurred as outlined in the Oregon State University Institutional Review Board guidelines (http://oregonstate.edu/research/irb/exempt-review), and the Northwest Portland Area Indian Health Research Board (http://www.npaihb.org/epicenter/page/irb_institutional_review_board_irb). Standard informed consent information were provided.

Consent obtained in person - Participants were handed the printed verbal consent document after they were contacted and agreed to meet, prior to being interviewed. The project was explained verbally following the outline of the printed verbal consent document. Participants were notified that copies of the taped interviews would be sent to their tribe, and other copies stored at USGS and in the Oregon State University Library Archives.

The estimated time commitment for a participant's involvement was approximately an hour, though actual time depended on participant's responses. Interviews were informal and semi-structured, allowing for participants to lead discussions where they felt information was relative to the question prompts.

Interviews were audio recorded after interviewees provided consent. Completed interviews were brought to Oregon State University, evaluated, and transcribed for further review. Transcripts of the interviews, redacted to remove sensitive references to places, activities, resources, and persons, will be maintained and housed at the Oregon State University Archives and at USGS ScienceBase. Audio files and unedited transcripts will be returned to the respective tribes.

Research Questions

This research collected and analyzed information based on the following general overarching question categories. Further questions evolved out of these categories depending on specific and individual tribal cultural practices, as interviews warranted.

- Do climate effects shape elements of cultural value?

  Are there cultural elements (e.g., dances or seasonally relevant ceremonies) and/or cultural behaviors (e.g., prayers, ceremonial routines, symbols, songs or words) that have adapted in direct response to the presence, abundance or other characteristics of fish, wildlife, or vegetation? Are there times when hunting/fishing/gathering is accompanied with certain behaviors (e.g., prayers, ceremonies or items of symbolic relevance)?

- Has tribal culture changed?

  Are there aspects of tribal culture that have been evolving, identifiable by responses to climate change impacts on fish, wildlife, and vegetation? and/or adapting measures that have been taken and or noticed as a response to climate change impacts to fish, wildlife and vegetation?

  Are there times when hunting/fishing/gathering is accompanied with certain behaviors (e.g., prayers, ceremonies or items of symbolic relevance)?

- Have adaptations occurred?

  Are there adaptations that have been made to cultural rituals, practices, or behaviors that are new or have not been traditionally practiced?

- How have cultures adapted to culturally traditional elemental changes?

  Are there stories that deal with the differences of "traditions" that juxtapose the "Tribal cultural ways" of old and present? Do tribal stories contain elements that show differences between traditional cultural ways and present practices?

During the semi-structured interview, participants were guided through specific questions to illustrate cultural traditions and practices that are dependent on plants and animals, and how these traditions have evolved through time. Participants were guided back to the topic focus areas if they drifted away from the core theme targeted by this study.

This study was not designed to test or firmly establish a cause-and-effect relationship between climate change and tribal cultural attributes. However, we intended to document preliminary evidence that may suggest a causal chain linking climate change at the regional scale (A), plants and animals exposed to those climate conditions (B), and elements of tribal tradition that depend heavily on those plants and animals (C). Our interviews were intended to establish primarily the last causal step (i.e., whether the fluctuations in the abundance and distribution of plants and animals and other environmental factors have resulted in modifications or adaptations of tribal cultural

traditions.) The research uncovered a third dimension to the proposed relationships described above (A,B,C). The data that emerged provided information that **seasonal changes and timing of events were the most significant of the findings**, and the clearest driver of whether adaptations were presently occurring or had transpired to affect the behaviors of the cultures involved with this study. The repeated responses of interviewees regarding timing and the importance of seasons was unforeseen at the outset of the study. This emergent topic became a driver for many of the conversations regarding the resources, and was evidently a common thread of change that all participants had witnessed, and were currently witnessing. Interviewees were not asked to speculate on whether B and C are a response to global or regional climate change, and it was not the intention of this research to establish, through new analysis, whether any of these changes mentioned by interviewees are a consequence of climate change.

6. PROJECT RESULTS.

The Table below summarizes some of the main themes as well as specific references identified by interviewees.

Table 1. Cultural attributes identified in interviews

Interviewee	Category	Specifics	Notes/Cultural Significance
Quinault Indian Nation			
Richard Allen	Animals	Wolf, turtle, eagle, elk, frog, snake	Traditionally held animals honored, ceremonies, songs, dances, hunting, traditional consumption, culturally important species that teach culture behaviors, timing, cultural identity markers
Richard Allen	Fish	Salmon, eels, seafoods, whales	Traditional foods, community activity, cultural tradition, timing marker of seasons
Richard Allen	Plants	Sweet grass, cattail	Culturally important, medicinal use, traditional consumptive (non medicinal), traditional basket weaving materials, timing marker of seasons/cultural time to gather
Richard Allen	Seasons	seasons	Timing correlating for information, traditional markers, eels, TEK systems, holistic time sequences (rather than linear)
Richard Allen	Water	Ocean, rivers	Traditional activities, traditional use for food
Richard Allen	Wood	Cedar, (red, yellow), yew, maple, alder; woods/forest	Traditional use, used for carving and canoe paddles, drum forms, avenue for items used in/with prayers, firewood, identifies location (forests), traditional identity marker
Norman Capulman	Animals	Sea lions, Bear (black), deer, bigfoot	Hunting, traditional songs
Norman Capulman	Fish	Salmon, crab, razor clams, bottom fish	Run depletions (salmon), traditional songs, traditional food
Norman Capulman	Plants	Huckleberries, salmonberries	Traditional cultural activity (gathering), traditional food
Norman Capulman	Seasons	unspecified	Gathering based on seasons, indicator for cultural behaviors

Interviewee	Category	Specifics	Notes/Cultural Significance
Norman Capulman	Temperature	Rain, winter, creekwater	Warmer temperatures during winter causing less snow, winters being colder in the past, more creekwater (as compared to in river) from snow melts at different times than in past so flows diverted.
Norman Capulman	Water	River, ocean, rain, snowmelt	Traditional food source, red tides, identification of rain volume decline, river coloration change
Norman Capulman	Wood	Forestry, Olympic Forest, logging, cedar	Songs, longhouses, clothing, baskets, canoes, less cedar than in past, paddles, firewood
Harvest Moon	Animals	Elk, raven, dog, frog, heron	Traditional animals, cultural story tellers, timing markers
Harvest Moon	Fish	Salmon, shellfish, oysters, whale	Cultural traditional foods, important role species in culture, identifies cultural patterns and teaches morals, values, culture
Harvest Moon	Plants	Sweet grass, stinging nettles, berries, roots	Traditional resource, medicinal use, basket material
Harvest Moon	Water	Ocean, river, lake	Traditional resource
Harvest Moon	Wood	Cedar	Traditional resource, basket material, canoes firewood, culturally core resource, timing, cultural identity marker
Doug James	Animals	Whale, Thunderbird, Crow, Eagle, Bear, Wolf, frog	Cultural icons for clans, culture teaching animals, spiritual, cultural identity marker
Doug James	Fish	Salmon, "fish" (general)	Traditional food, cultural food
Doug James	Fire	Heat, general unspecified	Commonly used, spiritual component
Doug James	Seasons	Summer, spring	Swimming, fishing, canoe journeys
Doug James	Water	Ocean, Rivers	"life", spiritual, food source, changing water, canoe journeys, cultural identifier, identity marker
Doug James	Wood	Cedar	Cultural use for Paddles, canoes, firewood
Justine James	Animals	Eagle, bear, wolf, crows, frog	Cultural icons, teaching animals, clans, food, spiritual
Justine James	Fish	Clams, salmon, eels, crabs, whale	Traditional foods, cultural icons, traditional cultural practices
Justine James	Fire	Fire (unspecified/general)	Spiritual component, heat source, Raven stories
Justine James	Water	Ocean, Rivers, lake	"life", spiritual, food source, changing water, canoe journeys, cultural identifier
Justine James	Wood	Cedar, forests	Totem poles, firewood, spiritual component, place identification
Confederated Tribes of Siletz			
Ed Ben	Plants	Identity/family identity, cultural tradition	Basketry

Interviewee	Category	Specifics	Notes/Cultural Significance
Ed Ben	Animals	Deer, Bear, beaver, salamander, rat	Dances, animals frequently encountered in environment
Ed Ben	Fish	Eels, salmon, mussels (river), trout, crawdads, fish (unspecified), crab	Traditional cultural food, cultural core practice, encountered in environment regularly
Ed Ben	Fire		Illumination for eeling, housing heat, smokehouse
Ed Ben	Seasons	unspecified	Marker for cultural traditional behavior, Fishing, dancing
Ed Ben	Water	Ocean, river, lakes	Beach dances, food source, cultural gatherings
Ed Ben	Wood	Spruce, cedar, bark (unspecified), alder, willow	Firewood, pitch, salmon house, fishing platform, smokehouse, canoe, cane poles, basketry. Identity/ family identity, cultural tradition discontinued
Constance Hartt	Animals	Eagle, hides (buckskin), seals	Traditional ceremonial use (feather), regalia use
Constance Hartt	Fish	Sand dollars, eels (silver, dark), clam, crab, fish (unspecified), chinook, mussels (river), catfish	Regalia, traditional food
Constance Hartt	Plants	Yellowdock, "Indian tobacco", seaweed, rhododendrons, wild potato (camas)	Medicinal use, traditional food; traditionally, cultural use was common, but often cannot be found and/or gathered for cultural purposes due to depletion, change of land/environment.
Constance Hartt	Temperature	River water	Water is warmer than used to be, affects traditional river food harvests
Constance Hartt	Water	Ocean, river, snow, falls, river	environmental changes affecting beach gatherings/ community, recreation; river water levels lower
Constance Hartt	Wood	Trees, plants (e.g. yellowdock), pitch, smoking foods, cedar	Becoming rarer, affecting medicinal use and cedar plank cooking
Oscar Hatfield	Animals	Elk, deer, cougar, bears, ducks, geese, flicker	Traditional animals, new increase in populations (geese), traditional food (duck), feather use for ceremonies, hides, regalia, dances, traditional teaching (morals, information)
Oscar Hatfield	Fish	Fish (unspecified), salmon, eels, steelhead, silvers, chinook, smelt, oysters, clams, rock oysters, crab, sea roses (anemones), crawdads, mussels	Traditional food sources, Gathered year round previously, population decline indicates change
Oscar Hatfield	Language	unspecified	Loss of language, songs in traditional language, information lost with language loss
Oscar Hatfield	Plants	Vegetation (general) ferns, foxglove, berries, seaweed, camas, woolenbritches,	Traditional resources, food source, used for money
Oscar Hatfield	Temperature	Water temperature	Water temperature increase, longer duration of higher temperature
Oscar Hatfield	Timing	markers	indication of specific activities, marker of when to initiate specific activities/behaviors
Oscar Hatfield	Water	Ocean, river, falls, rain, snowfall	Traditional food source, recreation, core resource

Interviewee	Category	Specifics	Notes/Cultural Significance
Oscar Hatfield	Wood	Firewood, cambium, forest, cedar	Arrows, bows, drying. smoking traditional foods, cedar plank salmon cooking
Bud Lane	Animals	Eagle, Hawk, seal lions, whales, robin, woodpecker, flicker, chicken, deer, elk, bear	Feathers for dances, seal skin hats for dances,
Bud Lane	Fish	Mussels(river), mussels (ocean), clams, dentalia, abalone, crawdads, eels, whale	Traditional food source, shells: money, traditional cultural decoration
Bud Lane	Seasons	Spring, summer, fall	Marker for ceremonial behaviors, marker for hunting/ fish/gathering
Bud Lane	Water	Ocean, river	Cultural area, food source
Bud Lane	Wood	Alder, cedar, fir	Weirs, firewood (3 types: cooking, prayer, ceremonial), canoes, gamble sticks (traditional culture game), sweathouse, dance plank house, bows
Confederated Salish Kootenai Tribes			
Louis Adams	Animals	coyote, deer, elk, frogs, horse	Traditional cultural icons, teach cultural morals and values
Louis Adams	Language	Aspects of traditional culture	New name for recently arrived bird species (bird with necklace) illustrating descriptive language mirroring environmental components
Louis Adams	Plants	Flowers, shrubs, roots, berries	Indicators of environment, Traditional gathering, traditional food, everything is part of humans and must be honored privately or ceremonially.
Louis Adams	Place	Geographical traditional areas	Serving as identity, basis for stories, hunting, fishing, songs are gathered (acquired) from place
Louis Adams	Seasons	Spring, summer, winter, fall	Plants emerging, animals behavior changes, affects traditional gathering practices
Louis Adams	Temperature	Wind, snow, winter	Colder weather when younger, warm(ing) winds
Louis Adams	Wood	willow	sweatlodge poles must be willow (for ceremonial correctness)
Mike Durglo	Animals	Bear, buffalo, horses, porcupine	Traditional food, cultural icon, cultural use (quills)
Mike Durglo	Fish & fishing	Cultural identity	Salish once known as 'fish eaters' but no longer because fish less available
Mike Durglo	Place	Geographic areas	Basis for stories, significant events, identification /confirmation of identity for tribal members
Shirley Trahan	Animals	Birds, dogs, porcupines	New birds, traditional pets, reduction in population, traditional beings, provide food, provide spirituality
Shirley Trahan	Language	Aspects of traditional culture	New name for recently arrived bird species (bird with necklace) illustrating language is descriptive based on environment

Interviewee	Category	Specifics	Notes/Cultural Significance
Shirley Trahan	Plants	Bear's ear, choke cherries, grasses (unspecified), service berries, thistles, napweed	Traditional uses, medicinal purposes, identification of non-traditional species crowding out traditional plants
Shirley Trahan	Temperature	snow	Halt of "snowy weather", less snow than in past
Shirley Trahan	Water	Ocean, river	Purity of waters is declining

This research collected and analyzed the qualitative information gathered in oral interviews based on the above general overarching question categories. Further questions evolved out of the categories depending on specific and individual tribal cultural practices. Tribes that identified with the ocean discussed more water-bearing activities and cultural relevance than the inland tribe of Montana for example.

The entries in the table above can, for the most part, be grouped in the following themes:

1. Water

Water is an important aspect for all tribes, and leads to one of the most delicate issues of the research. Water was identified as being sacred, bearing identity, being a geographical marker, as well as a source of nourishment. Water is culturally vital for many aspects of the tribes, particularly the ocean dwelling tribes who continue to value ceremonial canoe songs and journeys.

2. Fish

Fish were an important part of each tribe interviewed. Each tribe relied on at least one, if not more, fish species for a core traditional food that they gathered. This traditional reliance on fish further supports the tribal responses that water is a vital, and core, resource for all the tribes in the northwest that were interviewed. The tribal members interviewed continued to fish and expect fish as part of the cultural identity, and as a staple traditional food. The coastal tribes were in the past, and remain, heavily reliant on a variety of fish from river, riverine, and oceanic system. For ocean tribes, fish provide a sense of stability, are a resource barometer of how the water is, and are a strong aspect of their tribal identity as a people.

3. Traditional Animals

There are animals which are identified routinely as those used or relied upon for TEK. These animals vary from tribe to tribe, but there seems to be a core grouping which provides a cultural stability as well as a cultural identity for the tribal members. These animals can be representative of clan systems, and/or the basis for traditional cultural stories that pass along information and cultural lessons.

4. alteration of Seasonal Markers

Seasons play a vital role in cultural activities, and certain patterns that occur during the season have been hallmarks for individuals. These markers have been a strong basis for the TEK information that has been not only passed down, but relied upon. *Most traditional activities are tied not to a specific date but to an environmental cue or marker.* This seasonal marker issue presents an ongoing problem as the seasons are changing and shifting, and individuals are noting this drastic change in the patterns and the ability to rely on this information. This change also is forcing animals' patterns to shift, thus exacerbating the problem of being able to rely on TEK and maintain cultural appropriate behaviors.

5. Timing

Timing is typically thought of as an abstract concept, however the information that emerged from this research illustrated that the commonly deemed "Indian time" was not a construct that was even consciously acknowledged by those interviewed. Whereas the seasonal markers indicate the appropriate time of year to begin a culturally important activity, there are in addition complex relationships between activities and their respective sequences and timing. In other words, the correct time to begin a second activity is when the first activity is finished, regardless of how long the first one took. "Indian time" refers to this holistic notion of time, in contrast to the clock-driven western notion of time. If environmental change disrupts the integrity of the sequences in which resources are available, the concept of time is challenged.

The seasonal markers seemed to initiate this timing in a more broad sense, and then it was honed into a more specific sense of timing. This timing was most often centralized around specific cultural activities, and contained a sense of spirituality within its completion or active performance, so that activities and behaviors were not rushed, but rather time and care was taken to complete them in an appropriately cultural timeframe and environmental reciprocity was fully enacted when appropriate. Linear abstract-based time was not a factor when cultural activities occurred, such as canoe journeys or ceremonial practices. It also was evident that much of this time was closely tied to the natural resource which was most relevant to the activity, such as ocean patterns for canoe journeys, river levels and fish behavior for fishing, or the eel ants marker for beginning eeling. Once the actual cultural activity began, the timing was allowed to establish the pace, rather than a set time and/or date for either initiation or completion.

6. Wood

Wood is considered a basic staple, bearing importance within several areas. Wood is used for heat, but also as a cooking source for traditional materials and sometimes specific woods are used for cooking or for smokehouse drying. Wood is also used for ceremonial purposes, not only for certain fires such as dances or to heat a sweathouse but additionally masks, canoes, paddles, sweathouse lodge construction, totem poles, and fishing poles. This resource is one of the basic identifiers for coastal peoples, and has been used for nearly everything from canoes to clothing. It remains a staple and sacred element in culture because of the variety of uses and the sacredness it holds amongst all tribes regardless of geographic location.

Summary of the above themes

The most commonly mentioned changes were that of the seasons and timing as they related to the other more broad categories. The aspect of specific seasonality that has been relied upon has become problematic for most of the individuals involved, and is causing some distress as far as members' ability to rely on traditionally held information, along with the ability to carry out traditional cultural activities. This unexpected factor brought forth the issue of alteration and adaptation on a scale that is wide-ranging, over multiple areas of traditional culture. Aspects of traditional culture are being forced to be put on hold, or abandoned because of the timing changes. These responses ranged from traditional "talking story" and sharing cultural information periods, to reduced ability to physically collect traditional foods which caused alteration of ceremonial events.

7. ANALYSIS AND FINDINGS

Elders and members interviewed, noted cultural responses to environmental change that falls in several broad categories. These were selected based on the repeated responses that were given during interviews, as they emerged when analyzing the data. The following six topics are outlined and responses are given illustrating the rationale and cultural TEK perspective for each respective topic.

1. The most culturally significant aspect of climate change is how it affects the definition of time

The system of time is culturally based, and for the Native groups involved in this study it became apparent that time was also based in cues observed in the natural world that directly related to nature and the cyclical patterns that occurred and corresponded to culturally based traditions. Time was clearly articulated as being based on cycles which occur in nature, as well as and often in direct contrast to the western established manner. Timing has played a vital role in the lives of Natives, as it is an indication of when to initiate a traditional behavior. The most commonly articulated examples of timing are those behaviors of hunting, fishing, and gathering. There seems to be two progressions of time and seasons, and while they both are complementary in many aspects, they are also regarded separately.

Seasons have been hallmarks and indicators for longstanding periods of time for Indigenous populations. The linear concept of western European time has been difficult to manage as traditional patterns and "Natural Laws" have been relied upon and utilized as the guiding force for many tribal civilizations. Many of these seasonal markers are presently being used. There are weather cues, botanical cues, and animal cues that tribes have relied heavily on to know when a new season starts, or when is the culturally appropriate timing of an event or tradition. This seasonal alteration has been disruptive at best, but restrictive, and damaging for tribes in the northwest, and seems to be one of the strongest indicators of climate change, given the preponderance of information, both TEK and western scientific in nature. Oscar Hatfield (Siletz Elder) states:

> "Our weather is changing, our seasons are not definite like they used to be and you used to be able to count on the rains coming, in October, that brought you the fish up the river so we could catch fish and now sometimes you don't have any rain clear into December and the fish are so bad when they do come up the they aren't fit for human consumption. The tribe gets, the Siletz tribe, get 230 salmon tags, our annual harvest is two salmon per year for the entire tribe because our seasons have changed and the fish don't come up. Of course the Indians living like they did, off the land, had all kinds of stories that they believed in you know . . . and it's just like in the spring, you got carpenter ants, big black carpenter ants, and they didn't go eeling until they saw those carpenter ants, they came out to mate, grow wings and fly off and start new colonies and stuff - and that was what they marked when the weather was right to start eeling. Somehow it worked because the eels would come, they'd be there when those ants would come out when those ants came out - whether it was the time of the year, the weather, or what it was I don't know, and they marked other things the same way, but you can't do that anymore because of our weather, you know weather's changed so much that you, you can't mark anything like that there's no way to do it."

The carpenter ants have no direct biological connection to the eel spawning times or water levels, yet the emergence of the colonies historically corresponded to eel patterns in the river. This coincidental effect is a reliable event which has been relied upon for generations, and forms the basis for such TEK that can readily be produced and utilized for resources which occur in a given seasonal period. Though the eels no longer run in the Siletz River, the ants mark the timing, and the oral tradition of TEK is continued throughout the tribal community.

Clearly the general emerging season was recognized, as it was hallmarked through overarching environmental conditions, but the timing of when to begin the traditional fishing of eels was distinctly marked by the eel ants' emergence. This, in its own way, was akin to a timer going off, notifying the tribal members of the specificity of collection. Quinault member Doug James offered a similar narrative which occurs for the members relating to their traditional harvest of Blue Back salmon runs: "The older guys used to tell us that when the salmon berries start coming out, you'd start throwing your net out for blueback, and when we start seeing the salmon berries start coming out, we'd start seeing one or two even if they were games. We used to go out and start fishing for blueback."

2. Traditional culture and aspects are starting to become adapted

Varying traditional cultural elements are being altered in ways that many members see as temporary, and short term. This may or may not be the case, but can be assessed as an adaptation nevertheless. One of the specific cultural attributes for the Confederated Tribes of Siletz is to have seafood consumed during ceremonial events. The collection of seafood has been traditionally carried out since members can remember, and is integrated with traditional practices. This practice has been forcibly altered however from the increasing occurrence of red tide events (toxic algae). Red tides are altering food sources which have occurred during ceremonial events at different times of the year. The primary ceremonial event for the Confederated Tribes of Siletz is that of Nee Dash, or the Feather Dance. Bud Lane (Elder, CTSI) explains: "The Feather dance for Peoples of Southwest Oregon is the principal ceremonial religion and religious celebration that went on in Southwest Oregon. We call it Nee Dash in our language but it means the dance, so the dance is the actual action and manifestation that happens in the Feather Dance, in the Nee Dash, but the surrounding philosophy and beliefs and protocols are all part of that, so it's much larger, like I mentioned the dinners, everything that you do surrounding it really has an inter-connection to it, it's about life and birth and death and eternity and the world, and the creation, and so it's all encompassing, like most religions it encompasses our belief system about how we came to be, why we're here, what we're supposed to do while were here, what we're not supposed to do while we're here, that in a nutshell is the Nee Dash." The traditional dance occurs in the tribes reconstructed Dance House, which was crafted in the traditional manner by members of the tribe logging, splitting, erecting, and planking the Dance House by hand and minimal machinery. This is a ceremony which occurs at Summer Solstice each year, and is accompanied by prayers and gratitude for the abundance of resources, in the form of prayers, songs, dances, and consumption of traditional food items.

The identification of ocean seafood that is acquired was one of the aspects which accompanies the Feather Dance for Siletz Coastal Peoples. Bud Lane (Siletz Elder) noted: "... in the last 30 years, that I began to notice, is the frequency and the longer and longer length of red tides, ah, over on the coast where we go gather, for mussels and clams and things like that. There's been a depletion of those resources over the years, and actually, there was a couple years ago, might have been three or four years ago, a time when all the health officials said don't gather all year, not to gather for the whole year for mussels and that was really probably the worst part of it, but there's other parts where it used to be if there was a red tide it was kinda rare, and then it would be like in August or September where they'd shut you down where it got real hot here, when it was the hottest, but now it can happen early, really early like in June or July, but sometimes lasts longer, but that's one of the more notable things" This occurrence was occasional during late August or September when the temperatures rose, and now are occurring in early June. This has created an adaptation for foods served- substituting a more available but less valued item- and how meals are prepared for Feather Dance.

The red tides in Oregon and Washington are causing episodic intervals for collection and interrupting the ability to maintain traditional food collection to support cultural dances. These events can change from year to year, depending on the alteration of environmental conditions, and the time factors which have been relied upon ebb and flow, causing a much greater fluctuation in cultural traditional ways.

There are various food items which have been considered traditional or cultural foods that have been collected and consumed for tribal entities. These items are typically indigenous to the region and have some cultural significance to them that has been orally depicted within tribal histories. Many of the resources that are considered cultural foods are being altered and tribal communities are experiencing difficulties in their abilities to collect and sustain the food caches they have come to traditionally rely upon for health and wellbeing. Many of these items have not only a nutritional and cultural component, but also a spiritual component which is often overlooked by non-Indigenous societies, and therefore a monetary value or equivalent substitute cannot be placed on these cultural icons.

Oscar Hatfield (Siletz Elder) talking about the Elders' collecting resources and food consumption of eels and other fish when he was young: " It's one of the culture foods, it's something they have gathered every year...they canned them, they smoked them and dried them, they ate them fresh - salmon and eels both, and the salmon. Mainly because you got a run of steelhead that used to come up the river, then you had the silvers that came up the river then you had the Chinooks come up the river so you had fish in the river system year round. You gathered fish year round.

Yea, you always, when I was a kid, you always had potatoes and fish. I mean you got tired of eating it, sometimes that's all you had to eat was potatoes and fish. When I went to grade school everybody could tell where I was because I stunk like smoked salmon - always had a pocket full of fish."

There are specific times during given seasons where patterns and rituals are being able to be continued, based on resources that are fluctuating, or ability to perform traditions. Examples of this are fishing, hunting, and collection times which occur throughout the year at different intervals. One of the issues with this related to the markers of seasons, and the changing aspects of seasons which are being noted. Because of the reliance on such markers for events to traditionally be "start" in the culturally appropriate manner according to traditional beliefs, this reliance can cause delay or confusion, and is occurring in episodic intervals.

One example of this is the traditional period of time when some tribes deem it appropriate to tell stories, which if often a method utilized to share traditional information. This time period varies for the tribe's custom and belief, but generally occurs during the winter season. Mike Durglo (CSKT) explained one of the resource indicators for the Salish Kootenai that has been changing: "One of the things I learned recently, is that the peak runoff in the spring is occurring about two weeks earlier in the spring, and then the peak runoff in the fall is about two weeks later." This water runoff has ramifications not only for the animals and plants, but also for the time when the snow falls, prior to the runoff. The snowfall in late fall is an indicator for the beginning of traditional "talk story" time, and has been changing depending on the levels of snow. Traditionally this indicator for beginning traditional customs was a good snowfall of several inches, which could been seen covering the mountains in white, but now only a few inches provides a light covering of the surface is considered appropriate to be able to begin customary traditional ways.

Fig. 1 - Lake Flathead in Polson, Montana. The Flathead Indian Reservation is home to the Confederated Salish and Kootenai Tribes. Native bull trout and the weststlope cutthroat trout were the dominant fish of Flathead Lake and are a part of the fishing heritage of the Confederated Salish and Kootenai Tribes.

Episodic occurrences of favorable environmental conditions also force tribal communities to be flexible, and create a disturbance in the reliability and assurance of being able to maintain cultural traditional ways. The instability of patterns may bring ceremonial events sooner or later, but also create a complete void or inability to continue traditional practices in some years. This also creates an ever-increasing issue for tribal communities working with agencies to attempt and adjust timelines when necessary, for amending the established aspects for culturally appropriate gatherings.

The attempts to restore or maintain traditional cultural behaviors have been ongoing in many tribes, and some traditional practices have been on hold, but are being kept actively alive through retelling of traditional manners or visiting geographic areas, in an attempting to retain and regain the cultural traditional ways. This is complicated, however since the resources are being rapidly depleted and/or altered.

Fig 2 - Canoe landing site at Taholah WA. Ocean canoe journeys are an important cultural tradition for the Quinault, and traditions associated with them are currently actively maintained.

Fig 3. - Traditional canoe hung in Tribal Administration building at the Quinault Indian Nation, Tahola Washington. Canoes, and canoe journeys are seen by many as a symbol of cultural revitalization.

3. Some cultural aspects have been discontinued as a result of various impacts, but interviewees attributed the changes to factors other than climate

One specific example of how climate change may impact natural resources and creates a need for cultural adaptation is illustrated by the Confederated Tribes of Siletz's traditional marriage ceremony. It was commonplace for a woman who had accepted a man's marriage proposal to move into their new home after the man had gifted his dowry to her family. The new bride, whose belongings included a basket of gathered acorns, then proceeded to make acorn soup. This cooking ritual signified the completion of the marriage ceremony, and the couple was then viewed as a married entity. Because of the displacement of tribes and the dwindling population of oak trees in western Oregon this ritual for the Siletz women has become discontinued in practice, and current tradition is that only the man participates in gifting a dowry. Most tribal individuals state the changes in location were the reason for the traditional ceremonial behavior to be discontinued, but other patterns such as invasive species like Scotch broom and Himalayan blackberry prevent survival of oak seedlings, which require moist soil and ground cover of leaf litter for propagation and survival.

The Quinault Indian Nation described the traditional practice that Elders had for collecting eels during the spring. Because of eel population decline, this collection practice has all but died out amongst the younger generations, and only Elders request and remember this practice. The fish hatchery collects a small amount every spring, mainly for the Elders who request them. Justin James (Quinault Indian Nation) states: "A lot of the eels in this area, they started going out in about the 60s, some of the Elders from the 1900s still follow that old life-way of eating, preparing eels, and it's kind of a dietary change and as I mentioned earlier the logging practices have kind of altered the environment and so you don't get the eels as much, they come up the salmon river and go into the fish hatchery area and some people still gather them in there..."

Traditional culture is in the beginning stages of being significantly affected due to the changes of timing which have been noted, and traditional resources are unable to be sustained, maintained, or continued in the same manner as has been noted through oral history and TEK.

Nearly every participant noted a change, and expressed anxiety about this change, but additionally apprehension about the long term effects that would be witnessed. This trepidation falls in line with TEK observations which occur over longer periods of time to establish a pattern of change, and which are reliable as a source of informational data for sustainability efforts and subsistence traditions which tribal communities rely upon. Bud Lane (Siletz Elder) stated: " well we like to eat our foods, a big part of say, like the feather dance, we like to go get our traditional food, so usually we have like, ah mussel chowder, or we have ah, mussels just boiled and ate right out of the shell, and or clams, and so depending on how the tide affects it, the red tide is ah, whether you can eat it or not. And part of our way of getting together is to get everyone together and have a big meal and dance and then eat afterwards too I think a big part of most cultures is eating together, you know, sharing what the Creator provides for you... and so that's, that's changing, I mean there's still resources available, but as that unfolds and gets worse and worse there's change happening there. "

This process of collecting traditional ocean foods has been reliable and consistently held onto for generations, and the informational systems have been in place to transfer the information that has been observed. These ceremonial processes are heavily reliant on oral tradition and retention of information that is based in the sustainable practices that have been cultivated. This is a strong remnant of culture that was evident in all tribal communities interviewed for this project.

Ed Ben (Siletz Elder) stated: ""As far back as I can remember, I was taught to feather dance, probably when I was first able to walk. We used to go to different family homes for eating; for afternoon

meals or evening meals and at the end, later on in the evening - I always thought it was because there was nothing else to do . . . you know, bring out a drum. My earliest memory of dancing, as a real little boy was at the Williams family home, which was between Siletz and Logsden, about half-way between Siletz and Logsden, and Joanie Williams would sing for us kids we'd be out there dancing . Then later years, as we started growing up, most of the feather dancing we did was different gathering for like up on Government Hill at the old community center dancing up there, and the tribes traveled, the tribes got together up there."

This sustaining behavior for cultural tradition is consistent with individuals who have listened to the "Old ways" as they are often termed, and reclaimed the traditional mannerisms and patterns that have been lost or forcibly removed. Individuals now are seeking to fulfill the behaviors in traditional ways that were acknowledged and documented from anthropologists and the elder tribal members. Assimilation practices have been noted but many have retained and sought to rekindle many of the ways that have been lost but are recorded in either oral tradition, or through literary avenues. This is a consistent theme throughout Indian country, and extends further than just the three tribes researched for this project.

Figure 4. Ocean rock covered in mussels

4. Some cultural aspects are being maintained and no effects from any environmental changes are being noticed at this point in time

Siletz are continuing to gather shellfish and plants for traditional dances, and are maintaining most of the traditional manners of collection for ceremonies, songs, and dances without interruption. The Quinault are continuing to fish in traditional areas and on the Quinault River as well as fish for

Smelt though runs are decreased, and utilize their use of cedar for canoes, paddles, and fostering the ceremonial use of these. The Salish Kootenai are able to hunt and gather to continue their traditional ways.

Dances, songs, prayers, and traditional cultural activities of fishing, hunting, and gathering are being continued as they have been for all the tribes. The three tribes that were interviewed for this study all stated they were continuing their traditional cultural ways, but had noticed changes. These changes however did not stop them entirely, but rather produced an alteration, or oral documentation of the change event when needed.

5. Individuals expressed a sense of discomfort and unease about changes noticed with natural resources used for cultural traditions and subsistence

There were multiple reasons that people offered for natural resources changing, but all were hesitant and anxious about the manner in which these resources were being used, the rate of use, and the potential lessening of availability in the future. It was widely acknowledged that while resources are available, even those which were identified as scarce, the understanding of depletion was prevalent. This discomfort stems from uncertainty that cannot be explained with the traditional manners of stories, songs, or cycles that have been witnessed for generations. The commonly held knowledge, or TEK, cannot be relied upon because of the fluctuation and the enormity of the uncertainty. Part of this is attributed to the changing seasons and the markers that have been consistent throughout generations. Alterations and adaptations have been customary, however these changes have also been evolving in a slower manner, and sometimes fluctuate with a rubber-band effect, returning to a previously-known state in the environment. The discord and unease is reflected when individuals articulate their knowledge and attempts to rely on the TEK which is increasingly becoming unreliable since environments and ecosystems are unhealthy and dysfunctional as described and documented by the traditional manner. Many of the interviewees described **a sense of imbalance or unknowing because the environmental situations do not match the information that has been passed down through generations**, and the basis for which decisions are made. There is a definite incongruence with the way decisions are made, and cultural acknowledgement about how resources are used and the value they hold for Indigenous communities.

The Native and non-Native value systems for managing natural resources are glaringly incongruent, as they illustrate a differing system for analysis of environmental conditions, and the timing factors that go into the consideration of policy making. Tribal entities rely on the seasonality and timing as determined by observing the environment, whereas non-Native agencies rely on calendars to govern some activities, in a manner that is inflexible when resources can change from year to year. Moreover, the span of time over which data are used to determine a management policy (e.g., harvest season) is restricted to the period of observed data, or often less, whereas Tribal thinking is derived from collective wisdom handed down for generations.

Mike Durglo (CSKT) explained how water is valued: "water is pretty much the basis for life. It sustains us, we use water for cultural purposes, so, ah, one of the things I've been working on, as representative on the National Tribal Science Council, is implementing Traditional Knowledge, into the way, that, say the way that EPA develops water quality standards and the tribes throughout the country, want the EPA to look at cultural uses as a standard or a limit, so they might set the standard for e-coli, or fecal coliform at this level, but we're saying no it needs to be lower than that because we use that water for our sweats or we use it for ceremonial purposes, or for different things, not just to sustain our lives." Merely protecting health is not enough - water has spiritual value and should be kept very pure.

This is also echoed in the place-name for many tribal entities. One of the tribes within the Confederated Tribes of Siletz is Tututni, or "Tuu tuu deene", which literally means "people of the water". This type of identification is prevalent within many of the resources and geographic locations, and

transfers into ceremonial and traditional cultural practices. For the Quinault, Justine James explains the importance of the salmon for them: "The blue back for us is our most essential salmon. That's the one we have for our first salmon ceremony for. In the old days we used to have a mass village ceremony but nowadays each fisherman will have their own individual ceremony usually they give that salmon to an elder or a group." This identity of tribal people being tied to resources is common and can be found in not just foods, but also wood. Quinault Elder Richard Allen explains why wood masks are so vitally important: "It's status, who you are, who the family is, where you come from, comparable to like governors and senators."

This integration of natural resource and cultural tradition is built into a system of knowing along with tribal and personal awareness and identification. Eradication of resources is a removal of the very identification systems and aspects which Natives have been basing themselves on and with for multiple generations.

8. CONCLUSIONS AND RECOMMENDATIONS

This project produced both results that were unexpected, and some that were expected.

Many of the traditional cultural patterns were maintained, and some had been lost but there were efforts to regain them. Nonetheless, individuals expressed an unease and discord with the traditional stories and TEK information that behaviors were based upon for executing and delivering cultural traditional mannerisms. The informational system in place is no longer reliable for the implementation of maintaining traditional behaviors, and ineffective for communities and traditional cultural survival, for oral documentation. Adaptation is occurring, but individuals are noticing an increase in adaptive measures, and are uneasy about it. The Elders all expressed concern about the environmental changes that are occurring, and how the situation is not in the same state it used to be where information, patterns, and predictions could be relied upon.

Because the individuals are all so connected with the land, this is an essence of their identity, regardless of geographic region. This change in environmental systems seems to be bringing about an identity crisis, as individuals are witnessing environmental events transpire that they find frustrating, not least because TEK is increasingly ignored. The environmental changes cause a great deal of confusion, and markers such as the seasons as well as boundary place-markers are threatened, altering, and in some cases disappearing. These have been longstanding traditionally relied upon measures which cannot be explained, nor are being rectified by any agency or entity. The information they have documented for generations is changing more rapidly than ever before, and many individuals are frustrated and confused as to what they can do to maintain traditional areas and customs in order to maintain identity. Others are waiting for changes that are more pronounced to take effect, and maintaining traditional customs in the meantime, which include prayers and renewal behaviors that have been relied upon for centuries. While these behaviors seem archaic and non-scientific to many, the cultural relevance of such activities is strong, providing a sense of comfort, tradition, and empowerment for the tribal communities. These activities also fall in line with TEK mannerisms, and are appropriate within the context.

There were problems that arose due to time constraints and removed parameters from the onset of the outlined approval of the research. Initially, four tribes were selected and they readily agreed and approvals were obtained. Each tribe was carefully selected to gather data from two inland and two coastal tribes, and then data collected from corresponding tribes could be compared to one another. One inland tribe was removed by the sponsor only a few weeks prior to interviewing, creating an awkward situation which led to a credibility issue. As the researcher and contact liaison person, multiple attempts were made to smooth the situation with the tribe, as research times and dates had already been established, so that future cooperative efforts could be continued. The three remaining tribes were identified, but the research design was weakened and instead of 2x2 comparisons among differing geographical regions and differing cultural practices, looser analysis of similarities had to be performed.

Approval for this research involved separate approval processes with each tribe - usually involving the Tribal Council - and with OSU's Institutional Review Board. This additional complication of time and process is commonplace for Natives and has nothing to do with the topics of research, but rather the timelines and regulations which have been outlined and that tribal operations follow. Moreover, individual tribes' practices may vary regarding the extent to which a researcher may release data.

Just as many mainstream Americans are aware of hunting and fishing seasons, licensures, and rules, likewise many Natives know treaty-rights and sovereignty issues that guide the basis for rules governing traditional practices of hunting, fishing and gathering. These issues came up with individuals acknowledging the parameters under which Natives operate and through on-reservation and tribal systems. These systems can differ greatly from other non-Native entities, particularly state and federal systems, and it is imperative agencies and entities are aware of this difference. Time was problematic as well, as many Native systems are holistic or circular in manner, rather than linear as in mainstream American culture. The time allotted for research interviews was minimal, and many individuals expressed distress at the short amount of time, or asked the researcher to return for a lengthier discussion of topics. Extended discussions are common practice in traditional Native culture, as many Elders expect a preliminary discussion, consuming a meal together, and then discussion again following the meal. Traditional cultural practices often include food when entering into discussions of any depth.

For this project to be expanded, several changes would need to be made, and a longer period of completion established. The study would need to investigate in further depth, the cultural practices, and would need to have longer periods of time on reservation areas and tribal homelands regions. There would need to be built in timelines for meals, as well as for follow-up sessions. Additional allowances would need to be made for factors like elders with mobility issues, or last-minute schedule changes. Longer time periods for study would allow for better collection of data, and would allow the researcher to be culturally sensitive to the tribal participants in the study. Tribes that were similar in size and geographic region would again be selected, however agreements that no tribal entity would be cut without serious discussion between all parties involved, including tribal councils or departments, to ensure cooperative and culturally sensitive etiquette was adhered to. Tribal systems and information could then be better compared, and a more comprehensive set of data could be examined and analyzed for all parties involved.

There is a consistency in attitudes that the recapture of cultural traditions is vital and coincides with seventh generation prophecies. Individuals who have listened to the "Old ways" as they are often stated, and who have reclaimed the traditional mannerisms and patterns that have been lost or forcibly removed, are now seeking to fulfill the behaviors in traditional ways that were acknowledged and documented from anthropologists and the elder tribal members. Assimilation practices have been noted but many have retained and sought to rekindle many of the ways that have been lost but are recorded in either oral tradition, or through literary avenues. This is a consistent theme throughout Native American populations, and is an ongoing goal for many tribes, moreso than just the three tribes researched for this project. Examining this phenomenon of restoration of cultural activities and traditional ways, examining in further depth how this is being accomplished in the midst of climate change and environmental changes would be highly beneficial.

Based on the information gleaned from this study, as well as information noted above, the researcher recommends that this research move forward in another study, examining the changes that are being noted and adaptation in topics which have not been researched to this point. This could include areas which were not included in this study such as specific dances, songs, and/ or cultural ceremonial events. This research project is groundbreaking in the aspects it examines cultural attributes that coincide with TEK and natural resources, and cultural traditional mannerisms. Further evaluations with more tribal entities would be beneficial for all parties involved, since most tribal communities share and assist with information and cultural practices when possible. A further in-depth study would also assist stake-holders and other entities which engage in government-to-government relations and help with understanding the reasons why Native populations are the

hardest hit with natural resource turbulence and alteration. Native culture is highly integrated with natural resource use, consumption, and identification.

Recommendations:

1. Learn your own and others' stories of change, and how that was mitigated, adapted to, or addressed.
2. Identify cultural elements that are tied to changing natural resources - seasonal cues / markers, specific species, etc. that hold value or are core components for the culture and/or the tribe's identity.
3. Start discussions addressing how to deal with the changes identified, and employ efforts that follow cultural guidelines.

9. MANAGEMENT APPLICATIONS AND PRODUCTS:

The results of this study will be utilized to further examine cultural events that are being altered or adjusted. It is anticipated that agencies and non-tribal entities will be able to better understand the scope and dynamics of tribal traditional culture, and be able to facilitate better cooperation and coordination efforts to combat environmental effects that may impact communities at large, to the best possible benefit for all involved.

The institutions involved with this project included: Northwest Climate Science Center, Oregon Climate Change Research Institute, Climate Impacts Research Consortium**,** the Confederated Salish-Kootenai Tribes, the Confederated Tribes of Siletz, and the Quinault Indian Nation.

This research should be able to provide managers with additional information based on a cultural system that is expansive and multi-dimensional, as well as providing cultural understanding for Native tribes that are involved in government-to-government or government-to-agency relations. State and federal agencies that manage natural resources could re-examine the disconnect between calendar-driven restrictions on hunting and fishing, Native utilization of resources and knowledge of timing, and climate-driven shifts in timing.

10. OUTREACH

This project resulted in a wide range of outreach activities, but these occurred after the NW CSC funding for this project ended and therefore they are not included here.